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R.W. Gilpin
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General



ENCLOSED ARC LAMPS



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Enclosed Are



Lamps

General Electric Company

Schenectady, N.Y.

Supply Dept.

No. 1015.

Sept. 26, 1898.



Enclosed Arc Lamps

The arc light was one of the first applications of electricity and its development is characteristic of the rapid improvement in electrical apparatus. Perhaps, however, in no other department of electrical industry has progress been so noticeable.

The different types of arc lamps manufactured to-day provide for arc lighting from almost any circuit and at almost any voltage.

Comparison of Open Arc and Enclosed Arc Lamps Each of these lamps is designated by some special adaptability to a particular purpose, but they may all be classed as open arcs or enclosed arcs. In the open arc, air has free access to the carbons, and at the high temperature, causes rapid combustion. By enclosing the arc in a small globe made nearly air-tight, combustion takes place more slowly and the life of the lamp with one trimming is much increased. Although the lengthened life alone effects a saving in carbon, it is not the only advantage of the enclosed arc lamp.

A convenient method of distribution is requisite to any successful lighting system. Lamps in series are not necessarily inconvenient for street lighting, but interior illumination

**Adjustment
for
Different
Voltages** demands a system in which every lamp is independent. The potential required at the arc in our enclosed arc lamps is easily obtained from circuits of different voltages, by the adjustment of a small resistance coil contained in the top of the lamp. The enclosed arc lamp is, therefore, well adapted to direct connection across the mains without exterior rheostat, and when so connected can be cut in or out just as independently as an incandescent lamp.

The labor of trimming an arc lamp is dependent on the life of the lamp. As the carbons in enclosed arc lamps may be used several

**Carbon Life
of
Enclosed Arc
Lamps** weeks without renewal, the cost of attendance is extremely small. Incidental to the economy thus secured, the inconvenience of a daily visit from the lamp trimmer and the accompanying annoyance of flying dust are completely banished. Modern devices for holding and lowering globes render the lamps convenient to handle, and permit rapid trimming without danger of breaking globes.

Cleanliness and security from flying sparks result from the use of enclosed arc lamps.

Enclosed arc lamps may be safely installed in mills and factories where delicate fabrics and combustible materials are freely exposed.

The added resistance in series with the Superior Quality of the Enclosed Arc Light lamp serves as a check to sudden changes of the current and the closely fitting enclosing globe makes the arc independent of atmospheric conditions.

The enclosing globe serves to diffuse the intense light of the arc, but for interior illumination, the light is further softened by light opal outer globes. Clear powerful illumination is combined in the enclosed arc lamp with diffusion, steadiness and perfect control. The light possesses the clear whiteness of daylight and may be used in stores and mills where color matching with precision is required. Owing to the diffusion of the light by the

Shadows Softened by the Diffused Light enclosing globe, intensely dark shadows of the lamp frame and surrounding objects are avoided.

In addition to many other advantages of our enclosed arc lamps, the operating mechanism has been reduced to so few parts that certainty of positive and efficient action is assured. Our enclosed arc lamps are of compact design, and we have taken special care to equip them with well proportioned, attractive outer casings.

The following undisputed advantages of our enclosed arc lamps are worthy of careful attention:

EVERY LAMP INDEPENDENT;
SMALL MAINTENANCE COST;
SAFETY FROM FLYING SPARKS;
SUPERIOR QUALITY AND STEADINESS OF LIGHT;
FREEDOM FROM DUST AND ANNOYANCE OF
FREQUENT TRIMMING;
SIMPLICITY OF MECHANISM.

ENCLOSED ARC LAMPS
FOR
DIRECT CURRENT
CIRCUITS



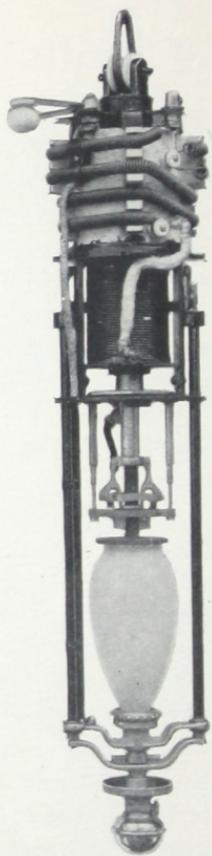
CARBON FEED ENCLOSED ARC LAMP
For 110 Volt Direct Current Circuits

Arc Lamps for 110 Volt Circuits

**The Field of
Arc
Lighting
Extended**

High economy combined with independent control warrants the installation of our enclosed arc lamps in many places where an arc lighting system has heretofore been considered entirely unsuitable. The carbon feed principle by which the clutch acts directly upon the carbon is employed in all our enclosed lamps. It provides for even feeding of the carbon and permits the construction of an extremely short lamp.

Our standard carbon feed lamp for 110 volt direct current circuits is only 28" long over all and is therefore especially adapted to installation in halls, vestibules, libraries, restaurants and rooms with low ceilings. Compact form and neat ornamentation, combined with quiet, steady action are advantages characteristic of the carbon feed lamp, and make it particularly suitable for indoor illumination. In this lamp the potential at the arc is 80 volts and the added resistance adapts it for use on 110 volt circuits. The normal current is 5 amperes.



MECHANISM OF
CARBON FEED ENCLOSED ARC LAMP
For 110 Volt Direct Current Circuits

Interior illumination frequently demands a short ornamental lamp of less powerful illumination than our standard 5 ampere lamp. In such cases lamps can be furnished for $\frac{3}{8}$ "

The Mechanism carbons taking 3 amperes and
of the giving a life of 75 hours with
Carbon Feed one 12" carbon.

Lamp The mechanism of the carbon feed lamp is remarkable for simplicity and positive action. A single magnetizing coil surrounds a cylindrical armature and central brass tube through which the carbon is fed. The clutch is attached to the lower end of the tube and acts directly upon the carbon. No carbon rod is required. A pair of air dash pots at the top of the tube cushions the upward pull of the solenoid producing a steady lifting of the upper carbon, but allowing it to drop instantly when released. The dash pots are accurately

Accurate constructed and are furnished
Construction with plungers of German
of the silver. Special care is used
Dash Pots in testing this part of the mechanism.

Current is supplied to the carbon through a contact device provided with springs which press radially upon the interior of the tube. Perfect contact with a minimum amount of friction is insured by this device. In trimming the lamp the upper carbon is simply pushed into a spring clip.



CARBON FEED ENCLOSED ARC LAMP

For 110 Volt Direct Current Circuits

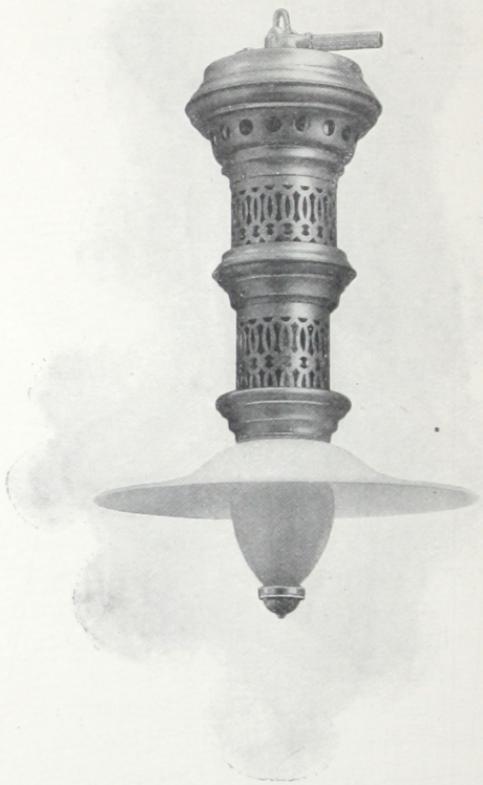
Weatherproof Casing

Carbon feed lamps for 110 volt direct current circuits are regularly manufactured for 3 and 5 amperes. In appearance and general construction the 3 ampere and 5 ampere lamps are identical, but the 3 ampere lamp has a winding of higher resistance. The 3 ampere carbon feed lamp is not recommended for



outdoor use. The 5 ampere lamp is provided with three loops in the spool winding to which connections may be made adapting the lamp to 4, 4.5 or 5 amperes as desired. It uses $\frac{1}{2}$ " carbons and has a life of 130 to 150 hours.

For outdoor service the 5 ampere lamp is furnished with a weatherproof casing, which affords ample protection. When desired, however, we can furnish as an additional precaution our new arc lamp hood, shown in the accompanying illustration.



CARBON FEED
MINIATURE ENCLOSED ARC LAMP
For Direct Current Circuits

The Miniature Enclosed Arc Lamp

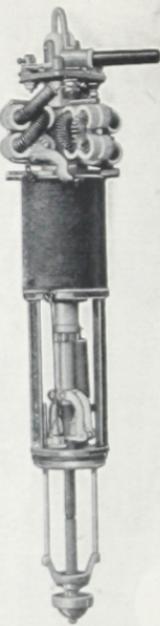
The introduction of the Miniature Arc Lamp provides for the use of arc light in smaller units so that it may compete with oil, gas and incandescent lamps in illuminating halls, offices, display windows and rooms of limited area.

Heretofore, arc lamps have been designed to give an intensely bright light and they naturally required considerable current. For

Special Field some installations such lamps for the are not desirable. With low Miniature ceilings, for example, an intense Arc Lamp light over-illuminates the area directly beneath it, while other parts of the room are comparatively dark.

In our new Miniature Arc Lamp, the illuminating power and the current are much less, so that several lamps are not more expensive to operate than one large lamp, and by thus dividing the total amount of light required, the general illumination is much improved. The Miniature Arc Lamp is also suitable for places where a large arc lamp would supply more light than necessary.

The Miniature Arc Lamp is designed for 110 volt direct current circuits, but an adjustable resistance has been provided in the top of the casing adapting the lamp to any line voltage from 100 to 120.



MECHANISM OF CARBON FEED
MINIATURE ENCLOSED ARC LAMP
For Direct Current Circuits

The standard current required by the Miniature Arc Lamp is 2.5 amperes, but a loop in the magnet coil permits an adjustment for 3 amperes. The life is from 40 to 45 hours

**Carbon Life
of the** with standard current, and from 35 to 40 hours with 3 amperes.

Miniature The lamp operates at from

Arc Lamp 73 to 75 volts at the arc, and when adjusted for 2.5 amperes

with a line voltage of 110, the energy at the terminals is 275 watts.

The mechanism of the Miniature Arc Lamp operates on our well known carbon feed principle. The carbon is fed through a brass tube which extends through the center of the magnet coil. The double cam clutch which operates directly upon the carbon is remarkable for simplicity of operation and few parts.

Special attention has been given to the design

**Small Size
of the** of the carbon holders and the general arrangement of the frame to facilitate rapid trimming.

Miniature In size the Miniature Arc Lamp is a striking contrast to lamps which were sold for interior illumination a short time ago.

Arc Lamp For general data on the Miniature Lamp see table on page 48.

No outer globe is used. Each lamp is arranged with a switch so that it can be readily thrown in or out of circuit.



CARBON FEED ENCLOSED ARC LAMP

For Direct Current Circuits

Marine Type

The Marine Enclosed Arc Lamp



The carbon feed principle has been utilized in the construction of a compact and well protected lamp especially adapted to installation in warehouses and holds and cabins of ships. The marine enclosed arc lamp is 28" long and its mechanism is identical with that of the standard carbon feed direct current lamp. It

**A Compact
and Well
Constructed
Lamp** has a black enamel weatherproof casing and a cylindrical outer globe protected by a heavy wire guard. A ground brass ornamental casing will be furnished if ordered.

This lamp is adapted to use on 110 volt circuits and requires 80 volts at the arc. Its normal current is 5 amperes, but loops in the spool winding permit of adjustments for 4, 4.5 or 5 amperes as in the standard carbon feed direct current lamp. The marine lamp has a carbon life of 130 to 150 hours.



CARBON FEED ENCLOSED ARC LAMP
For Direct Current Power Circuits

Power Circuit Lamps

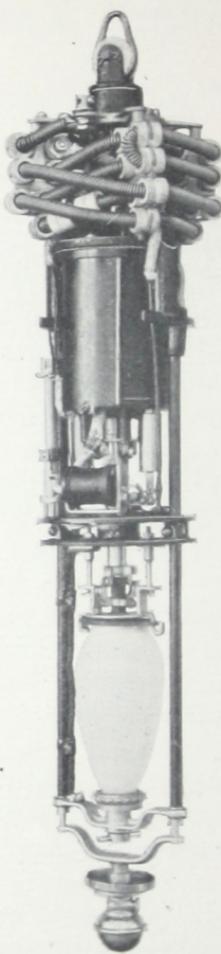
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Power Circuit Arc Lamps are designed for operating two in series on 220 volt circuits, or five in series on 500 volt circuits. Our recently developed Power Circuit Lamp is substantial,

Long Carbon Life an Economical Feature efficient and simple. Its long carbon life saves carbon and labor in trimming. In general outline and exterior appearance, the lamp is similar to our well known alternating and direct current carbon feed enclosed arc lamps. It is made in both single and double globe types.

On account of the high voltage of the circuits on which these lamps are designed to operate, a safe and positive cut-out

A Safe and Positive Cut-out Provided is required by insurance regulations. We have taken extra precaution to make our cut-out device absolutely reliable. In the top of the lamp there is an extra set of resistance coils which are not in circuit unless the lamp fails to operate. If the carbons stick, or the lamp, for any reason, fails to operate, the cut-out sends the current through the resistance coils instead of through the carbons, and thus prevents damage to the lamp. To demonstrate the effectiveness of the device, we have allowed



MECHANISM OF
CARBON FEED ENCLOSED ARC LAMP
For Direct Current Power Circuits

lamps to remain cut out for several hours at a time. No damage resulted to the coils or other parts of the lamp. The extra resistance in our lamp is of sufficient capacity to dissipate all the energy of the arc,

The Globe if necessary. The globe Lowering lowering device with which the Device Power Circuit Lamps are fitted has been furnished with over 30,000 General Electric enclosed arc lamps. The globe is released by turning a milled screw at the side of the casing, and automatically locks when it is replaced.

The accompanying illustration shows that the mechanism of the Power Circuit Lamp consists of very few parts,—in fact, no lamp on the market can compare with it for simplicity and positive action. The carbon

Mechanism is fed by a double cam clutch of the which has already won favor by Power Circuit its smooth, yet certain action. Lamp An adjustable resistance in the top of the casing permits the lamps to be used two in series on circuits of 200 to 240 volts, or five in series on circuits of 500 to 600 volts.

Power Circuit Lamps can be furnished in weatherproof, black or brass casings.

For general data on the Power Circuit Lamp see table on page 48.



CARBON FEED ENCLOSED ARC LAMP
For 220 Volt Direct Current Circuits

The 220 Volt Lamp

Having been first in the market with a satisfactory and substantial enclosed arc lamp for operating two in series on 220 volt circuits, we are glad to announce that we have

A Carbon Feed Lamp for Multiple Connection perfected a carbon feed lamp for direct connection across 220 volt mains. In our new lamp, provision is made for line voltages from 210 to 250 by means of a variable resistance contained in the top of the lamp.

The lamp operates with 150 volts at the arc and takes a normal current of 2.5 amperes.

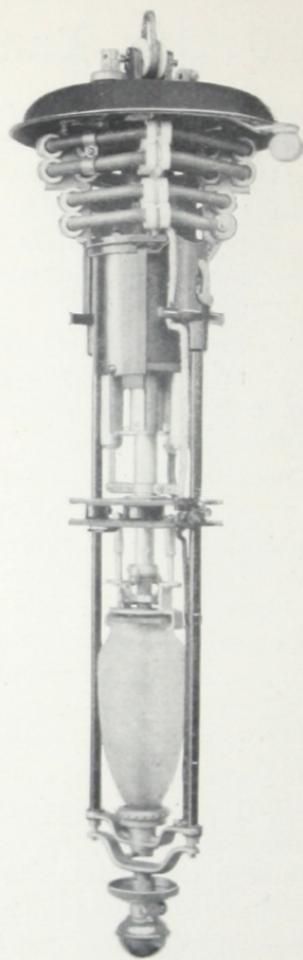
About 550 watts are required per lamp.

The 220 Volt Lamp with one trimming gives a life of from 130 to 150 hours, and during that time, requires absolutely no attention. As

One New Carbon for each Trimming in our other carbon feed lamps, the carbons are so proportioned that the lower carbon at the end of the first run of 130 or 150 hours, is long enough for an upper carbon for the next run.

The length of the arc is about $1\frac{1}{8}$ inches, and the light is therefore of less volume and more violet than in lamps with shorter arcs.

The advantages of a 220 volt lamp, capable of independent operation, frequently compensate for the diminution of light as compared with our 5 ampere power circuit



MECHANISM OF
CARBON FEED ENCLOSED ARC LAMP
For 220 Volt Direct Current Circuits

lamp for connection two in series across 220 volt mains. A quick break switch is provided on each lamp.

Special attention is called to the intense light obtained with our single globe style of lamp. While it is not recommended where diffused illumination of the walls and ceiling is desirable, it is well adapted to use in dry goods stores, display windows, restaurants, mills and other places where a large volume of intense light is required.

The 220 Volt Lamp is perfectly weatherproof, and can, therefore, be installed without a hood.

It is suitable for vestibules, doorways, window fronts, etc.

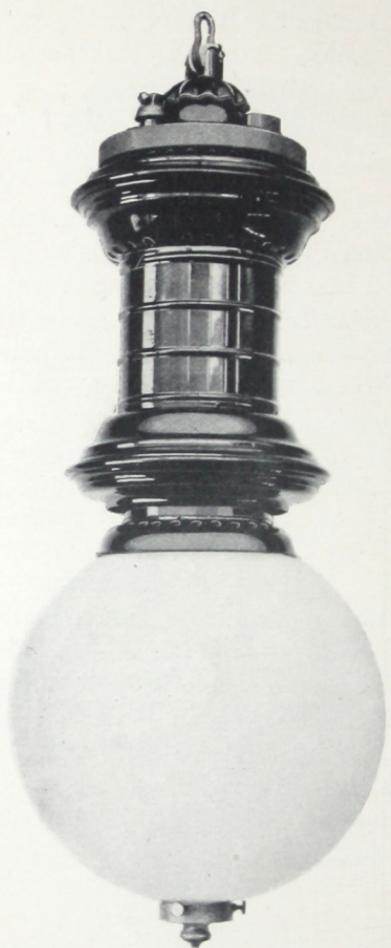
For **Exterior** **Illumination**

For interior illumination we furnish ground brass or attractive black enamel casings.

For outdoor service, the standard casing is weatherproof, and finished in black enamel.

The 220 Volt Lamp is manufactured in single and double globe types.

For general data on the 220 Volt Lamp see table on page 48.



CARBON FEED
CONSTANT CURRENT ENCLOSED ARC LAMP
For Direct Current Circuits

Constant Current Enclosed Arc Lamp

* * * *

After carefully considering the problem, we have developed a thoroughly reliable enclosed arc lamp for constant current circuits.

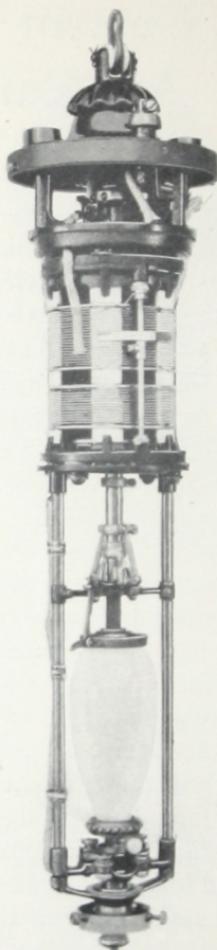
This lamp has the valuable carbon feed

For Direct Current Series Arc Systems principle, and combines with it the compact, symmetrical and ornamental construction of other types of General Electric enclosed arc lamps to which

this principle has been applied. The Constant Current Enclosed Arc Lamp can be installed on constant current systems using 6.6 amperes. Compared with open arc lamps, its annual cost of operation is considerably less, depending on the number of hours of

Adapted to Various Installations use per day. In addition to economy of operation the constant current enclosed arc lamp, combining soft diffused light with compact, ornamental construction and long life, furnishes one of the most satisfactory methods for illuminating large stores, offices, railway stations and public buildings, from series arc circuits.

The General Electric Company offers to the trade an enclosed arc series lamp with a



MECHANISM OF
CARBON FEED CONSTANT CURRENT
ENCLOSED ARC LAMP

single enclosing globe. In this lamp the intense rays from the arc are reflected by a porcelain shade, but the diffusion is not so complete as with a double globe lamp. It is, however,

Manufactured in Single and Double Globe Types well adapted to street illumination and installations requiring intense light.

The Constant Current Enclosed Arc Lamp is also manufactured in double globe type. In all General Electric enclosed arc lamps, the clutch acts directly on the carbon. The action of the clutch is positive, and the absence of a feed rod permits the construction of lamps of unusually short and compact design.

The outer globe of the Constant Current Enclosed Arc Lamp is supported by a special globe lowering device, by which lowering and raising the globe is rendered

Weatherproof Casing for Outdoor Installation extremely simple.

The weatherproof casing for outdoor lamps affords sufficient protection without the use of hoods. Weatherproof lamps are suitable for installation in streets, sheds, cellars, or other locations exposed to rain and dampness.

The constant current lamp is furnished with a differential winding with both shunt and series coils wound on one spool and arranged so that the magnets give a direct pull on the mechanism. All levers and loose parts are thus

dispensed with, and friction is reduced. An adjustable shunt is provided around the series coil for regulating its strength, and, consequently, the voltage at the arc. The lamp

Action of the Automatic Cut-out is furnished with an automatic cut-out which closes the circuit when the carbons are consumed, or if the carbons should stick.

The lamp is finished in ground brass or black enamel for interior installation, and in weatherproof black enamel for outdoor use. The lower frame of the single globe lamp is nickel plated and polished.

As in all other General Electric carbon feed arc lamps, the upper carbon in the constant current lamp is long enough after one run to use as a lower carbon for the next run.

The lamp burns from 100 to 120 hours without any attention whatever, and during that time consumes but $9\frac{1}{2}$ inches of $\frac{1}{2}$ " carbon. Aside from the diminished cost of carbon and the labor of trimming, the convenience of a lamp which will operate for several weeks without attention is a sufficiently strong argument for its introduction.

The use of meters on arc systems is constantly growing in favor and as it furnishes the only equitable basis of charge it is to be highly recommended. The energy used

by Constant Current Enclosed Arc Lamps can readily be measured by recording wattmeters. Department stores find the meter system particularly advantageous as it enables them to compute the running expense of each department.

For general data on the Constant Current Lamp see table on page 48.



SINGLE GLOBE TYPE
OF ENCLOSED ARC LAMP

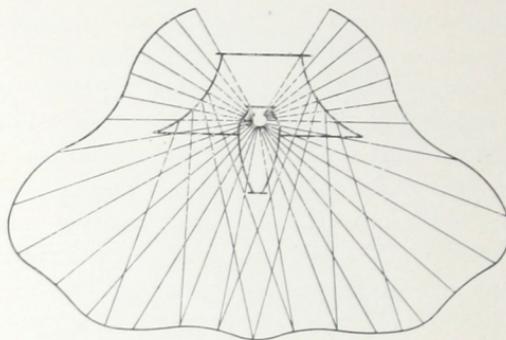
Single and Double Globe Enclosed Arc Lamps

The absorption of light by the outer globes in enclosed arc lamps with two globes, as usually constructed, amounts to from 10% to 30%, depending upon the kind of glass. This amount of light is necessarily sacrificed to obtain perfect diffusion. If, however, intensity is the chief requisite and diffusion only a secondary requirement, arc lamps of the Single Globe Type are preferable since they leave available, for illumination, the light usually absorbed by the outer globe.

Double Globe for Diffusion Our miniature enclosed arc lamp is made only in the Single Globe Type. All the other standard arc lamps for Intensity are so constructed that they may be used with outer globes or with single globes and reflectors.

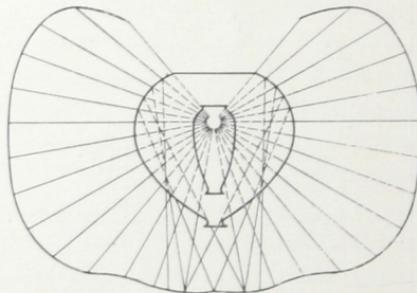
The design of the reflector for all Single Globe Lamps has been carefully considered with a view of obtaining the best diffusion of light. The glazed interior of the reflector is carefully prepared to prevent absorption and to improve reflecting qualities. The lower frame of all standard General Electric lamps is of narrow rectangular section with the thin side towards the light, so that no noticeable obstruction is offered and yet a rigid construction is secured.

Notwithstanding the increased intensity of the illumination obtained from the Single Globe Lamp, great care should be taken in deciding



upon this type of lamp for any particular installation.

The accompanying diagrams were plotted to



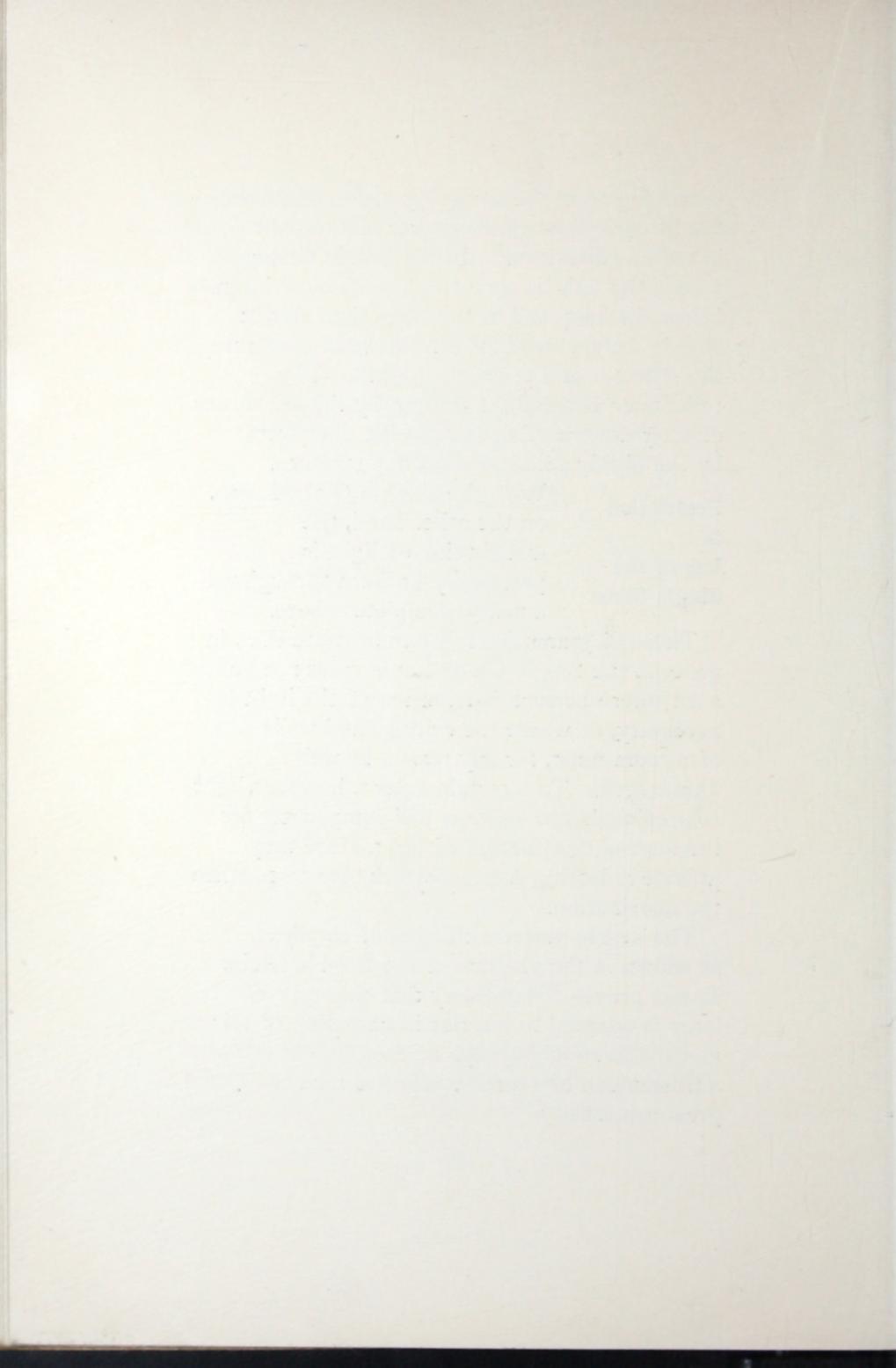
show the distribution of light obtained with both the Single and Double Globe Types of arc lamps. The length of the radial lines,

extending from the enclosing globe, represents the intensity and candle-power of the light in various directions. In the Single Globe Lamp, the light is seen to be much more intense below the lamp and at the sides than above; that is, only a small amount of light penetrates the reflector and proceeds upward. The remainder of the light emitted by the arc shines directly downward or is reflected downward by the highly polished reflecting surfaces.

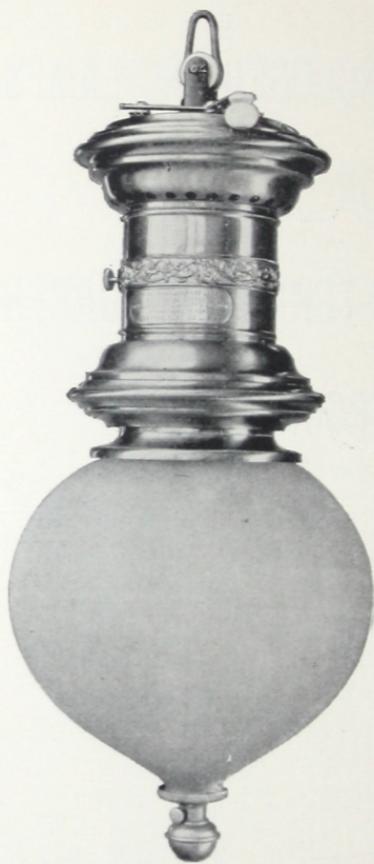
Restriction to Use of the Single Globe With the Double Globe Lamp, on the other hand, the distribution of light is practically uniform throughout a nearly complete sphere.

These diagrams forcibly demonstrate that, in general, the Single Globe Lamp must not be used where perfect distribution of the light is necessary, or where the ceilings and walls of a room must, for any reason be well illuminated. To a certain extent, however, light colored walls and ceilings will compensate for the uneven distribution of light, since they provide reflecting surfaces which tend to equalize the distribution.

The nearly perfect diffusion of the light, as shown in the diagram of the Double Globe Lamp, proves conclusively that this type of lamp is adapted to interior illumination of all kinds, and should always be used unless diffusion can be sacrificed for the sake of greater intensity.



ENCLOSED ARC LAMPS
FOR
ALTERNATING CURRENT
CIRCUITS



CARBON FEED ENCLOSED ARC LAMP
For Alternating Current Circuits

Arc Lamps for Alternating Current Circuits

Low economy and noisy uncertain action of arc lamps on alternating current circuits have given rise to the opinion that no satisfactory alternating arc lamp could ever be manufactured.

**Operation
of the
Alternating
Arc Lamp**

Our recently perfected alternating enclosed arc lamp destroys the ground for such an opinion by operating on constant potential

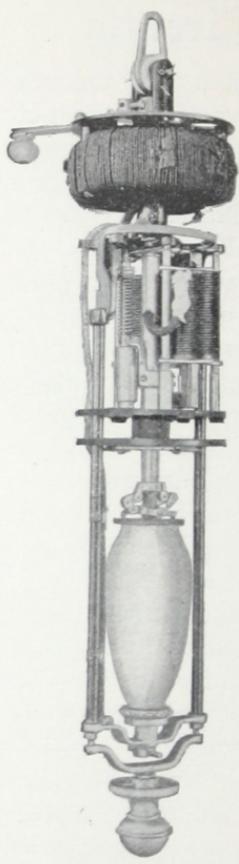
alternating current circuits with high economy and greatly diminished noise. Its introduction extends the application of arc lighting in directions hitherto impossible.

The inherent qualities of the enclosed arc make it eminently superior to the open arc in maintenance, cost and efficiency. A comparison of the open and enclosed *alternating* arcs

**Economy
of the
Alternating
Arc Lamp**

shows even a more marked difference in economy in favor of the enclosed arc than with *direct current* lamps.

After the first trimming the alternating enclosed arc lamp gives from 80 to 100 hours of light with one new $9\frac{1}{2}$ " carbon. A long arc is maintained and the light from the incandescent carbons is consequently emitted without obstruction. The arc itself is also much more luminous than an open arc.



MECHANISM OF
CARBON FEED ENCLOSED ARC LAMP
For Alternating Current Circuits

The enclosing globe protects the arc from drafts of air, and sudden action of the mechanism producing unsteady light is not liable to occur.

The life of a lamp is frequently stated as the number of hours it will burn without re-carboning, but the important commercial consideration is the number of hours a lamp will burn without any attention whatever. Our alternating enclosed arc lamp burns from 80 to 100 hours with one trimming. During that time it consumes but $9\frac{1}{2}$ inches of $\frac{1}{2}$ " carbon and requires no attention.

Only one $9\frac{1}{2}$ " carbon is inserted in the alternating enclosed arc lamp at each trimming after the first. After it serves as an upper carbon during the first run of 80 to 100 hours, it is long enough to use in the lower holder for

A Novel and Economical Feature the next run of the same length. The use of a single carbon in trimming a lamp is a novel feature in both our alternating and direct current lamps and effects great economy in carbons as well as simplicity in trimming. The cost of the carbon for one lamp for a run of 80 to 100 hours is about $2\frac{1}{2}$ cents.

The construction of the alternating enclosed arc lamp is the result of exhaustive experiments. The mechanism is supported on a frame having a double base, which makes a

dead air space above the arc chamber and protects the mechanism from the heat of the arc. It is simple, consists of few moving parts and is quiet yet positive in its action. A special **Construction** adjusting spring keeps the current constant regardless of the position of the core. **of the** **Alternating** The lamp is constructed to **Arc Lamp** operate on constant potential circuits of 100 to 120 volts at 60 or 125 cycles frequency. The same lamp can therefore be used with a simple adjustment on circuits of various voltages and frequencies. About 70 volts are required at the arc and the normal current is 6 amperes per lamp.

The actual power required by the alternating enclosed arc lamp is 430 to 450 watts, but the apparent power indicated by volt-ampere

Comparing readings is about 600 watts. In **Efficiencies** comparing the efficiencies **of Various** of various lamps, the power **Lamps** required should always be measured by wattmeters; if ammeters and voltmeters are used, only the apparent watts can be determined.

An inductive resistance or reactive coil contained in the ornamental top of the lamp and connected in series with the arc, gives the necessary reduction in voltage and at the same time is very effective in preventing sudden changes in current and corresponding

unsteadiness of the light. Economy is not unduly sacrificed by the introduction of this inductive resistance, since it consumes less than 35 watts.

Artistic Design and Handsome Appearance Well chosen proportions and the judicious use of ornamentation give the alternating enclosed arc lamp a handsome appearance. The

lamp is furnished with ornamental ground brass or black enamel casing.

The black enamel casing is weatherproof and suitable for outdoor service.

Clear outer globes
and opal inner globes are regularly supplied with lamps for interior installation. For outdoor use both outer and inner globes are furnished in clear glass.

Globes and Self-locking Safety Device The outer globe is supported by a self-locking safety device. To lower the globe, loosen the ball beneath it by unscrewing it a few turns, raise the globe slightly and release by turning the release screw on the side of the casing. To replace the globe, simply push up until it automatically locks and then tighten by screwing up the ball.

The carbons used in this lamp are $9\frac{1}{2}'' \times \frac{1}{2}''$ upper and $6'' \times \frac{1}{2}''$ lower—one cored, one solid.

The use of high grade carbons with

GENERAL DATA ON CARBON FEED ENCLOSED ARC LAMPS.

DIRECT CURRENT.						ALTERNATING.	
	110 Volts.			220 Volts.		220 and 500 Volts.	
	3 Amp.	5 Amp.	Miniature. 2.5 Amp.	Marine.	2.5 Amp.	5 Amp.	Series.
Length over all							
Weight with globes	28 ⁰	28 ⁰	18 ⁰	28 ⁰	31 ⁰	30 ⁰	
Current used	23 lbs.	23 lbs.	9 ¹ / ₂ lbs.	24 ¹ / ₂ lbs.	23 lbs.	29 lbs.	
Carbon life	3 Amp. 7.5 hrs.	5 Amp. 40-45 hrs.	2.5-3 Amp. 130-150 hrs.	5 Amp. 130-150 hrs.	5 Amp. 130-150 hrs.	6.6 Amp. 100-120 hrs.	6 Amp. 80-100 hrs.
Carbons { Upper	12 ⁰	12 ⁰					
Lower	5 ¹ / ₂ ⁰	5 ¹ / ₂ ⁰					
Outer Globe	Shape	Pear	Pear	Cylindrical	Pear	Pear	Spherical
Top Diam.	6 ⁰	6 ⁰	None	6 ⁵ / _{8⁰}	6 ⁰	6 ⁰	5 ⁷ / _{8⁰}
Max. Diam.	12 ⁰	12 ⁰	12 ⁰	6 ⁵ / _{8⁰}	12 ⁰	12 ⁰	12 ⁰
Bottom Diam.	2 ⁰	2 ⁰	used	2 ⁰	2 ⁰	2 ⁰	12 ⁰
Height	11 ¹ / _{2⁰}	11 ¹ / ₂ ⁰	11 ¹ / ₂ ⁰	11 ¹ / ₂ ⁰			
Enclos-	Top Diam.	1 ⁷ / _{8⁰}	1 ⁷ / ₈ ⁰	2 ⁰	1 ⁷ / ₈ ⁰	2 ⁰	1 ⁷ / ₈ ⁰
ing	Max. Diam.	2 ¹ / _{8⁰}	2 ¹ / ₈ ⁰	3 ⁰	2 ¹ / ₈ ⁰	3 ⁰	2 ¹ / ₈ ⁰
Globe	Bottom Diam.	1 ³ / ₈ ⁰	1 ³ / ₈ ⁰	1 ³ / ₈ ⁰			
	Height	5 ¹ / ₈ ⁰	5 ¹ / ₈ ⁰	4	5 ¹ / ₈ ⁰	6 ¹ / ₂ ⁰	6 ¹ / ₂ ⁰

Dimensions of Porcelain Shade for Miniature Lamp, 11⁰ x 2⁵/₈⁰.

Dimensions of Porcelain Shade for Larger Lamps, 15¹/₂⁰ x 6⁷/₈⁰.
Single Globe Lamps operate at same current, use standard carbons and inner globes. Lamps are slightly shorter and weigh a few pounds less.

the alternating enclosed arc lamp is essential.

Unless otherwise ordered lamps are shipped adjusted for 125 cycles and 104 volts.

The superiority of our alternating enclosed

**Advantages
of the**

**Alternating
Arc Lamp**

arc lamp is well established by the following valuable

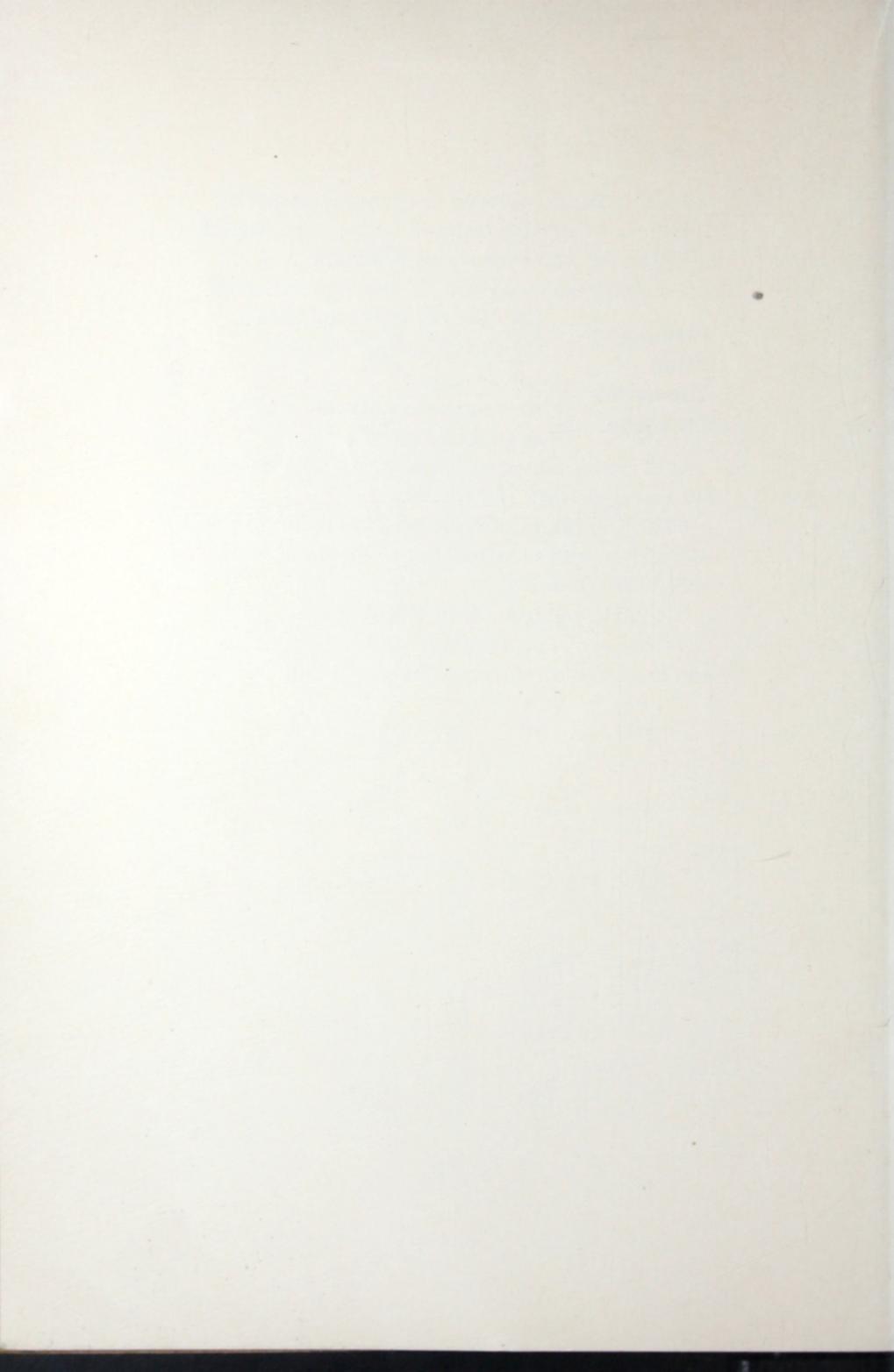
advantages :

It consumes only 430 to 450
actual watts.

It is easily adjusted for 60 or 125 cycles and for voltages from 100 to 120.

80 to 100 hours of light are obtained with one 9 $\frac{1}{2}$ " carbon and no attention is required except at trimming.

The field for the use of the alternating enclosed arc lamp includes large stores, shop windows, restaurants and public buildings.



ARC LAMP
CEILING SUSPENSIONS
BRACKETS AND
REFLECTORS



ORNAMENTAL LAMP SUSPENSION
FOR HIGH CEILINGS

Ceiling Suspensions



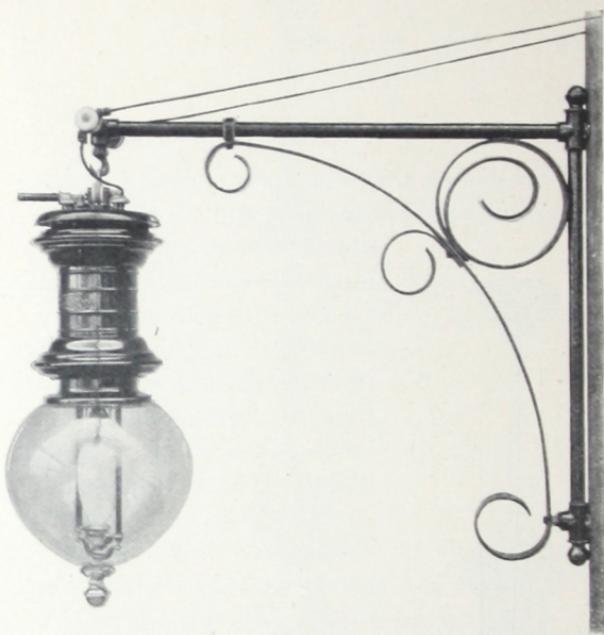
When lamps are to be hung several feet from the ceiling and where ropes and wires are

objectionable, our tubular suspensions will be found useful and ornamental. They are well constructed of brass in either ground or polished finish to correspond to the finish of the lamp. The suspensions conceal the lead wires and the lower ends are enlarged as shown in the illustrations to form symmetrical and closely fitting covers for the tops of the lamps. The standard overall lengths for tubular ceiling suspensions are two and three feet, but any desired length can be furnished.

Three styles, plain, fluted and rope pattern are manufactured, but the standard plain

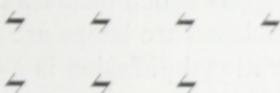
design, in two-foot lengths, will be furnished unless otherwise specified.





ORNAMENTAL SUSPENSION BRACKET
FOR ARC LAMPS

Ornamental Lamp Suspension Bracket



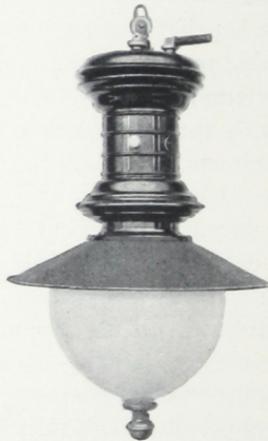
A suspension bracket will frequently furnish the most desirable method of hanging an arc lamp. Our ornamental wrought iron bracket was designed with special reference to use with short lamps, such as our carbon feed, direct and alternating current lamps. It is constructed of two lengths of wrought iron pipe, held at right angles to each other by a malleable iron elbow. A hard wood cross-arm supplied with porcelain insulators furnishes supports for the wires, and the lamp is hung on a suspension hook directly beneath the cross-arm. A large ornamental scroll of wrought iron fills the angle formed by the two pieces of pipe and makes the structure very rigid.

The dimensions of the standard ornamental lamp suspension brackets are as follows, but brackets of any desired dimensions can be supplied.

Distance from center of lamp to wall, 30".
Height of bracket, 24".

Reflector for Enclosed Arc Lamps

The enclosed arc lamp inherently gives better distribution of the light than the old type open arc lamps, because the enclosing globe is generally made of opal glass which diffuses the intense rays. When enclosed arc lamps are used with reflectors, additional diffusion is



obtained by the reflecting surfaces, and enclosed arc lamps for outdoor illumination can be installed closer to the ground than open arcs, with which distribution of light must be obtained by placing the lamps on high poles and sacrificing intensity of illumination. With enclosed arc lamps diffusion is so perfect that

intensity need not be diminished by great distance between the lamp and the object to be illuminated.

When enclosed arc lamps are used for **Use of Refectors for Street Lighting** municipal illumination, the best results are frequently secured by using reflectors, and suspending the lamps in the middle of the street at a distance of from 18 to 20 feet from the ground.

The reflector shown in the illustration is constructed of galvanized iron, painted white on the inner and reflecting surface, and black japanned on the outer surface. The shape of this reflector is entirely unlike the designs

Saving of Light by Use of Reflectors formerly used with older types of arc lamps. It adds to the appearance of the lamp and by reflecting useful rays downward saves light which would otherwise be lost. It also serves as a protection to the lamp where additional precautions against weather are considered necessary. Reflectors are especially recommended for alternating enclosed arc lamps which are by necessity of lower efficiency than direct current lamps.

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